

WIRELESS DEVICE DETECTION

CROSS-REFERENCE(S) TO RELATED APPLICATION(S)

This patent application hereby incorporates by reference in its entirety the pending Provisional Patent Application entitled MANAGED MESSAGING PLATFORM, Application No. 60/282,381, naming Marcellino Tanumihardja and Gregory Brown as inventors, filed via Express Mail on 5 April 2001, and also claims the benefit of this Provisional Patent Application No. 60/282,381 under the auspices of 35 U.S.C. 119(e).

FIELD OF THE INVENTION

The present application relates, in general, to wireless communication.

BACKGROUND OF THE INVENTION

Wireless communication refers to communication between sending and receiving stations via electromagnetic radiation not guided by any hard physical path (e.g., by microwave link). Examples of wireless communication are communication via cellular

telephony systems, Personal Communication Systems, or Global System for Mobile Communication systems.

Wireless communication is typically accomplished via users exchanging voice and/or alphanumeric data by use of at least one wireless device. One example of wireless communication is that of a first wireless-device user exchanging voice and/or alphanumeric data with a group of two or more other wireless-device users.

It has been noted by the inventors named herein (the inventors) that when a first wireless-device user finds it advantageous to exchange voice and/or alphanumeric data with a group of wireless-device users, the first wireless-device user may want to disseminate information to the group, or may instead want to both disseminate information to the group and receive feedback from the group members in response to the disseminated information. It has been further noted by the inventors that difficulties arise when the at least a first wireless device user and at least one wireless device user in the group of wireless device users are using different types of wireless devices. In particular, it has been noted that in such instances communication failure will often occur.

In light of the foregoing, the inventors have determined that it would be advantageous to have methods and systems which allow detection of a type of wireless device utilized by a particular user, so that communications to and from the wireless device could be processed in the fashion appropriate to the wireless device.

SUMMARY OF THE INVENTION

The inventors have devised methods and systems that allow detection of a type of wireless device utilized by a particular user, so that communications to and from the wireless device can be processed in the fashion appropriate to the wireless device.

In one embodiment, a method includes but is not limited to detecting a wireless-device capability. In addition to the foregoing, other method embodiments are described in the claims, drawing, and text forming a part of the present application.

In one or more various embodiments, related system(s) include but are not limited to circuitry for effecting the foregoing-described method(s); the circuitry can be virtually any combination of hardware, software, and/or firmware configured to effect the foregoing-described method(s) depending upon the design choices of the system designer.

The foregoing is a summary and thus contains, by necessity, simplifications, generalizations and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of this patent application will become apparent in the non-limiting detailed description set forth below.

DRAFTING "DEPT."

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

Figure 1 shows a pictographic representation of an environment wherein methods and systems described herein may be utilized.

Figure 2 shows a process that depicts detecting a wireless-device capability.

Figure 3 depicts that, in one implementation, method step 202 can include method step 300.

Figure 14 shows an implementation of the high-level logic flowchart shown in Figure 2.

Figure 15 shows two alternate implementations of the high-level logic flowchart shown in Figure 14.

Figure 4 depicts that, in one implementation, method step 202 can include method step 400.

Figure 5 shows that, in one implementation, the high-level logic flowchart further includes method step 500, which depicts presenting, in response to the detected wireless-device capability, a message at least partially in audible-presentation form, or tactile-presentation form.

Figure 6 depicts that, in one implementation, method step 500 can include method step 600.

Figure 7 depicts that, in one implementation, method step 600 can include method step 700.

Figure 8 depicts that, in one implementation, method step 700 can include method step 800.

Figure 9 shows that, in one implementation, method step 600 can include method step 900.

Figure 10 depicts that, in one implementation, method step 900 can include method step 1000.

Figure 11 shows that, in one implementation, method step 900 can include method step 1100.

Figure 12 depicts that, in one implementation, method step 1100 can include method step 1200.

With reference now to Figure 13, depicts a pictorial representation of a conventional data processing system in which illustrative embodiments of the devices and/or processes described herein may be implemented.

The use of the same reference symbols in different drawings indicates similar or identical items.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to Figure 1, shown is a pictographic representation of an environment wherein methods and systems described herein may be utilized. First, depicted in Figure 1 is that sender 100, by use of wireless device 102 creates a message via communication with Managed Messaging Platform (MMP) engine 104 (as shown, wireless device 102 may be any type of wireless device such as a Wireless Application Protocol (WAP) phone, a wireless Personal Digital Assistant (PDA), or a two-way pager). Second, illustrated is that MMP engine 104 sends message notifications to each wireless device 108 associated with each desired recipient forming group of desired recipients 106 (as shown, each wireless device 108 may be any type of wireless device such as a Wireless Application Protocol (WAP) phone, a wireless Personal Digital Assistant (PDA), or a two-way pager). Third, shown is that one or more desired recipients in group of desired recipients 106 view and/or respond to the message via communication with MMP engine 104, where such viewing and/or responding is achieved via each desired recipient's use of his or her respective wireless device 108.

Fourth, depicted is that sender 100, via communication with MMP engine 104, uses his wireless device 102 to check the message status and responses, where the statuses and responses may have been aggregated by MMP engine 104. For more details related to the foregoing scheme, please see herein incorporated by reference Provisional Patent Application 60/282,381.

Following are a series of flowcharts depicting implementations of processes. For ease of understanding, the flowcharts are organized such that the initial flowcharts present implementations via an overall "big picture" viewpoint and thereafter the following flowcharts present alternate implementations and/or expansions of the "big picture" flowcharts as either substeps or additional steps building on one or more earlier-presented flowcharts. Those having ordinary skill in the art will appreciate that the style of presentation utilized herein (e.g., beginning with a presentation of a flowchart(s) presenting an overall view and thereafter providing additions to and/or further details in subsequent flowcharts) generally allows for a rapid and easy understanding of the various process implementations.

With reference now to Figure 2, shown is an implementation of a high-level logic flowchart depicting a process. Method step 200 shows the start of the process. Method step 202 depicts detecting a wireless-device capability. Method step 204 illustrates the end of the process. In one device implementation, method step 202 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) when a user (e.g., a member of group of desired recipients 106) contacts the wireless web server entity via a wireless web browser running on the user's cell phone (e.g., wireless device 108).

For additional examples of the process of Figure 3 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381.

With reference now to Figure 3, shown is an implementation of the high-level logic flowchart shown in Figure 2. Depicted in Figure 3 is that, in one implementation, method step 202 can include method step 300. Illustrated is that, in one implementation, detecting a wireless-device capability can include, but is not limited to, detecting the wireless-device capability selected from a wireless-device-capability group which includes a WML (Wireless Markup Language) capable browser, a CHTML (Compact Hypertext Markup Language) capable browser, a Pocket Internet Explorer (IE) HTML (Hypertext Markup Language) capable browser, and a Voice XML (Extensible Markup Language) capable browser. In one device implementation, method step 300 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) when a user (e.g., a member of group of desired recipients 100) contacts the wireless web server entity via a wireless web browser (e.g., a WAP browser) on the user's web-enabled cell phone (e.g., wireless device 108).

For additional examples of the process of Figure 3 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 3 function substantially as described elsewhere herein.

With reference now to Figure 14, shown is an implementation of the high-level logic flowchart shown in Figure 2. Depicted in Figure 14 is that, in one implementation, method step 202 can include method step 1400. Illustrated is that, in one implementation, detecting a wireless-device capability can include, but is not limited to,

detecting a commercially available browser. In one device implementation, method step 1400 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) when a user (e.g., a member of group of desired recipients 106) contacts the wireless web server entity via a wireless web browser on the user's web-enabled cell phone (e.g., wireless device 108).

For additional examples of the process of Figure 14 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 14 function substantially as described elsewhere herein.

With reference now to Figure 15, shown are two alternate implementations of the high-level logic flowchart shown in Figure 14. Depicted in Figure 15 is that, in one implementation, method step 1400 includes method step 1500; further depicted is that, in another implementation, method step 1400 includes method step 1502; further depicted is that, in yet another implementation, method step 1400 includes method step 1504. Method step 1500 shows that, in one implementation, detecting a commercially available browser can include, but is not limited to, associating a mark-up language with a detected Pocket IE (Internet Explorer) browser. In one device implementation, method step 1500 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) via recall of a mark-up language type associated with a version number of Pocket IE browser when a user (e.g., a member of group of desired recipients 100) contacts the wireless web server entity via a wireless web browser on the user's web-enabled cell phone (e.g., wireless device 108).

Method step 1502 shows that, in one implementation, detecting a commercially available browser can include, but is not limited to, associating a mark-up language with

a detected UP.browser. In one device implementation, method step 1502 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) via recall of a mark-up language type associated with a version number of UP.browser when a user (e.g., a member of group of desired recipients 100) contacts the wireless web server entity via a wireless web browser on the user's web-enabled cell phone (e.g., wireless device 108).

Method step 1504 shows that, in one implementation, detecting a commercially available browser can include, but is not limited to, associating a mark-up language with a detected Palm Query Application browser. In one device implementation, method step 1504 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) via recall of a mark-up language type associated with a version number of Palm Query Application browser when a user (e.g., a member of group of desired recipients 100) contacts the wireless web server entity via a wireless web browser on the user's web-enabled cell phone (e.g., wireless device 108).

For additional examples of the process of Figure 15 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 15 function substantially as described elsewhere herein.

With reference now to Figure 4, shown is an implementation of the high-level logic flowchart shown in Figure 2. Depicted in Figure 4 is that, in one implementation, method step 202 can include method step 400. Illustrated is that, in one implementation, detecting a wireless-device capability can include, but is not limited to,

detecting the wireless-device capability via scanning of a Hyper Text Transfer Protocol (http) header. In one device implementation, method step 400 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) reading the http header associated with a wireless-device capability when a user (e.g., a member of group of desired recipients 100) contacts the wireless web server entity via a wireless web browser (e.g., a WAP browser) running on the user's web-enabled cell phone (e.g., wireless device 108). That is, when the wireless web server entity receives an http data unit, the wireless web server entity identifies the wireless-device capability based on a wireless-device capability with which the http header is associated.

For additional examples of the process of Figure 4 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 4 function substantially as described elsewhere herein.

With reference now to Figure 5, shown is an alternate implementation of the high-level logic flowchart shown in Figure 3. Depicted in Figure 5 is that, in one implementation, the high-level logic flowchart further includes method step 500, which depicts presenting, in response to the detected wireless-device capability, a message at least partially in audible-presentation form, visual-presentation form, or tactile-presentation form. In various device implementations, method step 500 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1), subsequent to detecting the wireless-device capability, causing a message to be presented through a wireless device (e.g., wireless device 102) through the wireless device's audio presentation system (e.g., the wireless device's speaker system), the wireless device's

visual-presentation system (e.g., the wireless device's screen), or the wireless device's tactile-presentation system (e.g., the wireless device's vibratory alert).

For additional examples of the process of Figure 5 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 5 function substantially as described elsewhere herein.

With reference now to Figure 6, shown is an implementation of the high-level logic flowchart shown in Figure 5. Depicted in Figure 6 is that, in one implementation, method step 500 can include method step 600. Illustrated is that, in one implementation, presenting, in response to the detected wireless-device capability, a message at least partially in audible-presentation form, visual-presentation form, or tactile-presentation form can include, but is not limited to, formulating message data into a wireless-device-capability-specific message via use of at least one wireless-device-capability-specific file set. In one device implementation, method step 600 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1), subsequent to detecting the wireless-device capability, causing a message to be presented through a wireless device (e.g., wireless device 102) by formulating message data (which makes up the message) into a format appropriate to the wireless device (that is, the message is put in a form the wireless device can "understand") via use of a file set appropriate to the wireless device through which the message is to be presented.

For additional examples of the process of Figure 6 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 6 function substantially as described elsewhere herein.

With reference now to Figure 7, shown is an implementation of the high-level logic flowchart shown in Figure 6. Depicted in Figure 7 is that, in one implementation, method step 600 can include method step 700. Illustrated is that, in one implementation, formulating message data into a wireless-device-capability-specific message via use of the at least one wireless-device-capability-specific file set can include, but is not limited to, retrieving at least one wireless-device-capability-specific XSL (Extensible Style Language) file set. In one device implementation, method step 700 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1), subsequent to detecting the wireless-device capability, formulating message data (which makes up the message) into a format appropriate to the wireless device (that is, the message is put in a form the wireless device can “understand”) via retrieval of a wireless-device-capability-specific XSL file set appropriate to the wireless device through which the message is to be presented (e.g. transforming the message data via use of the retrieved XSL file set).

For additional examples of the process of Figure 7 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 7 function substantially as described elsewhere herein.

With reference now to Figure 8, shown is an implementation of the high-level logic flowchart shown in Figure 7. Depicted in Figure 8 is that, in one implementation, method step 700 can include method step 800. Illustrated is that, in one implementation, retrieving at least one wireless-device-capability-specific XSL file set can include, but is not limited to, retrieving at least one wireless-device-capability-specific XSL file set from a wireless-device-capability-specific XSL-file-set group

which includes a WML capability-specific XSL file set, a CHTML capability-specific XSL file set, a Pocket IE HTML capability-specific XSL file set, and a voice XML capability-specific XSL file set. In one device implementation, method step 800 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1), subsequent to detecting the wireless-device capability, retrieving a wireless-device-capability-specific XSL file set from a wireless-device-type XSL-file-set library which in one implementation includes the foregoing specifically listed device-specific XSL file sets. However, those skilled in the art will recognize that the foregoing specifically listed device-specific XSL file sets are merely exemplary and that such listing is not exhaustive.

For additional examples of the process of Figure 8 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 8 function substantially as described elsewhere herein.

With reference now to Figure 9, shown is an implementation of the high-level logic flowchart shown in Figure 6. Depicted in Figure 9 is that, in one implementation, method step 600 can include method step 900. Illustrated is that, in one implementation, formulating message data into a wireless-device-capability-specific message via use of at least one wireless-device-capability-specific file set can include, but is not limited to, utilizing the at least one wireless-device-capability-specific file set in conjunction with an XML representation of the message to create a message appropriate to a browser. In one device implementation, method step 900 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) formulating a

message created by a sender (e.g., sender 100) into an XML representation of the message.

For additional examples of the process of Figure 9 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 9 function substantially as described elsewhere herein.

With reference now to Figure 10, shown is an implementation of the high-level logic flowchart shown in Figure 9. Depicted in Figure 10 is that, in one implementation, method step 900 can include method step 1000. Illustrated is that, in one implementation, utilizing the at least one wireless-device-capability-specific file set in conjunction with an XML representation of the message to create a message appropriate to a browser can include, but is not limited to, utilizing the at least one device-specific file set in conjunction with an XML representation of the message to create a message appropriate to a browser wherein the browser is selected from a browser-capability group which includes a WML capable browser, a CHTML capable browser, a Pocket IE HTML capable browser, and a voice XML capable browser. In one device implementation, method step 1000 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1), subsequent to formulating a message created by a sender (e.g., sender 100) into an XML representation of the message, converting the XML representation of the message (message data) into a message appropriate to a particular type of browser, which in one implementation includes the foregoing specifically listed device-specific browser types. However, those skilled in the art will recognize that the foregoing specifically listed browser types are merely exemplary and that such listing is not exhaustive.

For additional examples of the process of Figure 10 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 10 function substantially as described elsewhere herein.

With reference now to Figure 11, shown is an implementation of the high-level logic flowchart shown in Figure 9. Depicted in Figure 11 is that, in one implementation, method step 900 can include method step 1100. Illustrated is that, in one implementation, utilizing the at least one wireless-device-capability-specific file set in conjunction with an XML representation of the message to create a message appropriate to a browser can include, but is not limited to, retrieving at least one wireless-device-capability-specific XSL file set. In one device implementation, method step 1100 is achieved by a wireless web server entity (e.g., a part of MMP engine 104 of Figure 1) retrieving a wireless-device-capability-specific XSL file set appropriate to the wireless device through which the message is to be presented.

For additional examples of the process of Figure 11 and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/282,381. The remaining method steps of Figure 11 function substantially as described elsewhere herein.

With reference now to Figure 12, shown is an implementation of the high-level logic flowchart shown in Figure 11. Depicted in Figure 12 is that, in one implementation, method step 1100 can include method step 1200. Illustrated is that, in one implementation, retrieving at least one wireless-device-capability-specific XSL file set can include, but is not limited to, retrieving the at least one wireless-device-capability-specific XSL file set from a wireless-device-capability-specific XSL-file-set

group which includes a WML capability-specific XSL file set, a CHTML capability-specific XSL file set, a Pocket IE HTML capability-specific XSL file set, and a voice XML capability-specific XSL file set. (For example, such as was at least partially described in herein incorporated by reference Provisional Patent Application No. 60/282,381.) The remaining method steps of Figure 12 function substantially as described elsewhere herein. In one device implementation, method step 1200 is achieved by a wireless web server entity retrieving a wireless-device-capability-specific XSL file set from a wireless-device-capability-specific XSL-file-set library which in one implementation includes the foregoing specifically listed wireless-device-capability-specific XSL file sets. However, those skilled in the art will recognize that the foregoing specifically listed device-specific XSL file sets are merely exemplary and that such listing is not exhaustive.

Those having ordinary skill in the art will recognize that the state of the art has progressed to the point where there is little distinction left between hardware and software implementations of aspects of systems; the use of hardware or software is generally (but not always, in that in certain contexts the choice between hardware and software can become significant) a design choice representing cost vs. efficiency tradeoffs. Those having ordinary skill in the art will appreciate that there are various vehicles by which processes and/or systems described herein can be effected (e.g., hardware, software, and/or firmware), and that the preferred vehicle will vary with the context in which the processes are deployed. For example, if an implementer determines that speed and accuracy are paramount, the implementer may opt for a hardware and/or firmware vehicle; alternatively, if flexibility is paramount, the implementer may opt for a solely software implementation; or, yet again alternatively, the implementer may opt

for some combination of hardware, software, and/or firmware. Hence, there are several possible vehicles by which the processes described herein may be effected, none of which is inherently superior to the other in that any vehicle to be utilized is a choice dependent upon the context in which the vehicle will be deployed and the specific concerns (e.g., speed, flexibility, or predictability) of the implementer, any of which may vary.

The foregoing detailed description has set forth various embodiments of the devices and/or processes via the use of block diagrams, flowcharts, and examples. Insofar as such block diagrams, flowcharts, and examples contain one or more functions and/or operations, it will be understood as notorious by those within the art that each function and/or operation within such block diagrams, flowcharts, or examples can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or any combination thereof. In one embodiment, the present invention may be implemented via Application Specific Integrated Circuits (ASICs). However, those skilled in the art will recognize that the embodiments disclosed herein, in whole or in part, can be equivalently implemented in standard Integrated Circuits, as one or more computer programs running on one or more computers (e.g., as one or more server programs running on one or more computer systems), as one or more programs running on one or more processors (e.g., as one or more thin client programs running on one or more processors), as firmware, or as virtually any combination thereof, and that designing the circuitry and/or writing the code for the software or firmware would be well within the skill of one of ordinary skill in the art in light of this disclosure. In addition, those skilled in the art will appreciate that the mechanisms of the present invention are capable of being distributed as a program product in a variety of forms,

and that an illustrative embodiment of the present invention applies equally regardless of the particular type of signal bearing media used to actually carry out the distribution. Examples of a signal bearing media include, but are not limited to, the following: recordable type media such as floppy disks, hard disk drives, CD ROMs, digital tape, and transmission type media such as digital and analogue communication links using TDM or IP based communication links (e.g., packet links).

In a general sense, those skilled in the art will recognize that the various embodiments described herein which can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or any combination thereof can be viewed as being composed of various types of "electrical circuitry." Consequently, as used herein "electrical circuitry" includes, but is not limited to, electrical circuitry having at least one discrete electrical circuit, electrical circuitry having at least one integrated circuit, electrical circuitry having at least one application specific integrated circuit, electrical circuitry forming a general purpose computing device configurable by a computer program (e.g., a general purpose computer configurable by a computer program or a microprocessor configurable by a computer program), electrical circuitry forming a memory device (e.g., any and all forms of random access memory), and electrical circuitry forming a communications device (e.g., a modem, communications switch, or optical-electrical equipment).

Those skilled in the art will recognize that it is common within the art to describe devices and/or processes in the fashion set forth herein, and thereafter use standard engineering practices to integrate such described devices and/or processes into data processing systems. That is, the devices and/or processes described herein can be integrated into a data processing system via a reasonable amount of experimentation.

Figure 13 shows an example representation of a data processing system into which at least a part of the herein described devices and/or processes may be integrated with a reasonable amount of experimentation.

With reference now to Figure 13, depicted is a pictorial representation of a conventional data processing system in which illustrative embodiments of the devices and/or processes described herein may be implemented. It should be noted that a graphical user interface systems (e.g., Microsoft Windows 98 or Microsoft Windows NT operating systems) and methods can be utilized with the data processing system depicted in Figure 13. Data processing system 1320 is depicted which includes system unit housing 1322, video display device 1324, keyboard 1326, mouse 1328, and microphone (not shown). Data processing system 1320 may be implemented utilizing any suitable computer such as a DELL portable computer system, a product of Dell Computer Corporation, located in Round Rock, Texas; Dell is a trademark of Dell Computer Corporation.

The foregoing described embodiments depict different components contained within, or connected with, different other components. It is to be understood that such depicted architectures are merely exemplary, and that in fact many other architectures can be implemented which achieve the same functionality. In a conceptual sense, any arrangement of components to achieve the same functionality is effectively "associated" such that the desired functionality is achieved. Hence, any two components herein combined to achieve a particular functionality can be seen as "associated with" each other such that the desired functionality is achieved, irrespective of architectures or intermedial components. Likewise, any two components so associated can also be

viewed as being "operably connected", or "operably coupled", to each other to achieve the desired functionality.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that, based upon the teachings herein, changes and modifications may be made without departing from this invention and its broader aspects and, therefore, the appended claims are to encompass within their scope all such changes and modifications as are within the true spirit and scope of this invention. Furthermore, it is to be understood that the invention is solely defined by the appended claims. It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be understood by those within the art that if a specific number of an introduced claim element is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim elements. However, the use of such phrases should not be construed to imply that the introduction of a claim element by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim element to inventions containing only one such element, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an"; the same holds true for the use of definite articles used to introduce claim elements. In addition, even if a specific number of an introduced

claim element *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of "two elements," without other modifiers, typically means *at least* two elements, or *two or more* elements).

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